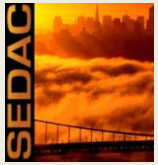




THE EARTH INSTITUTE
COLUMBIA UNIVERSITY



How Does CIESIN uses IT Resources for its Research?

Alex de Sherbinin, Deputy Manager
NASA Socioeconomic Data and Applications Center (SEDAC)

Center for International Earth Science Information Network
The Earth Institute, Columbia University
Palisades, New York, USA

CIESIN focus

- Data development, management, and dissemination
 - Active in Open Geospatial Consortium, GEO/GEOSS, CODATA
- Research on human dimensions of global environmental change
 - Climate focus: impacts, vulnerability, and adaptation
- Software: ESRI ArcGIS, SPSS, Stata, R
 - ENVI and Matlab
- Looking towards developing capabilities in human-environment systems modeling

Exposure to Current Hazards as a Way of Understanding Potential Future Vulnerabilities to Climate Change



Red = Drivers

Blue = Coupled Human-Environment
System w/Vulnerability

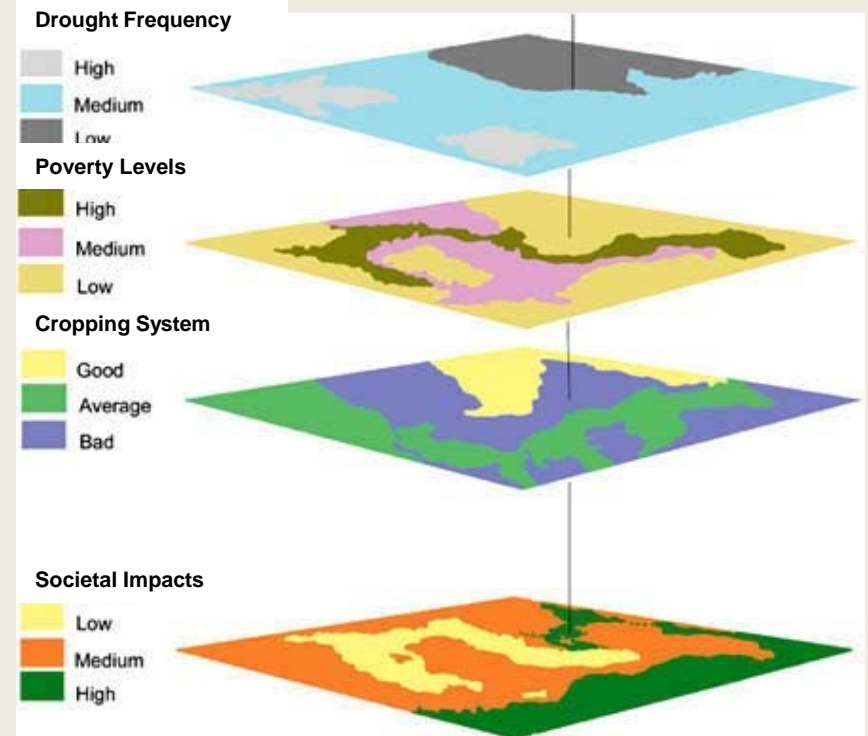
- = System feedbacks



At the Global Scale: GIS is Useful for Vulnerability Assessment

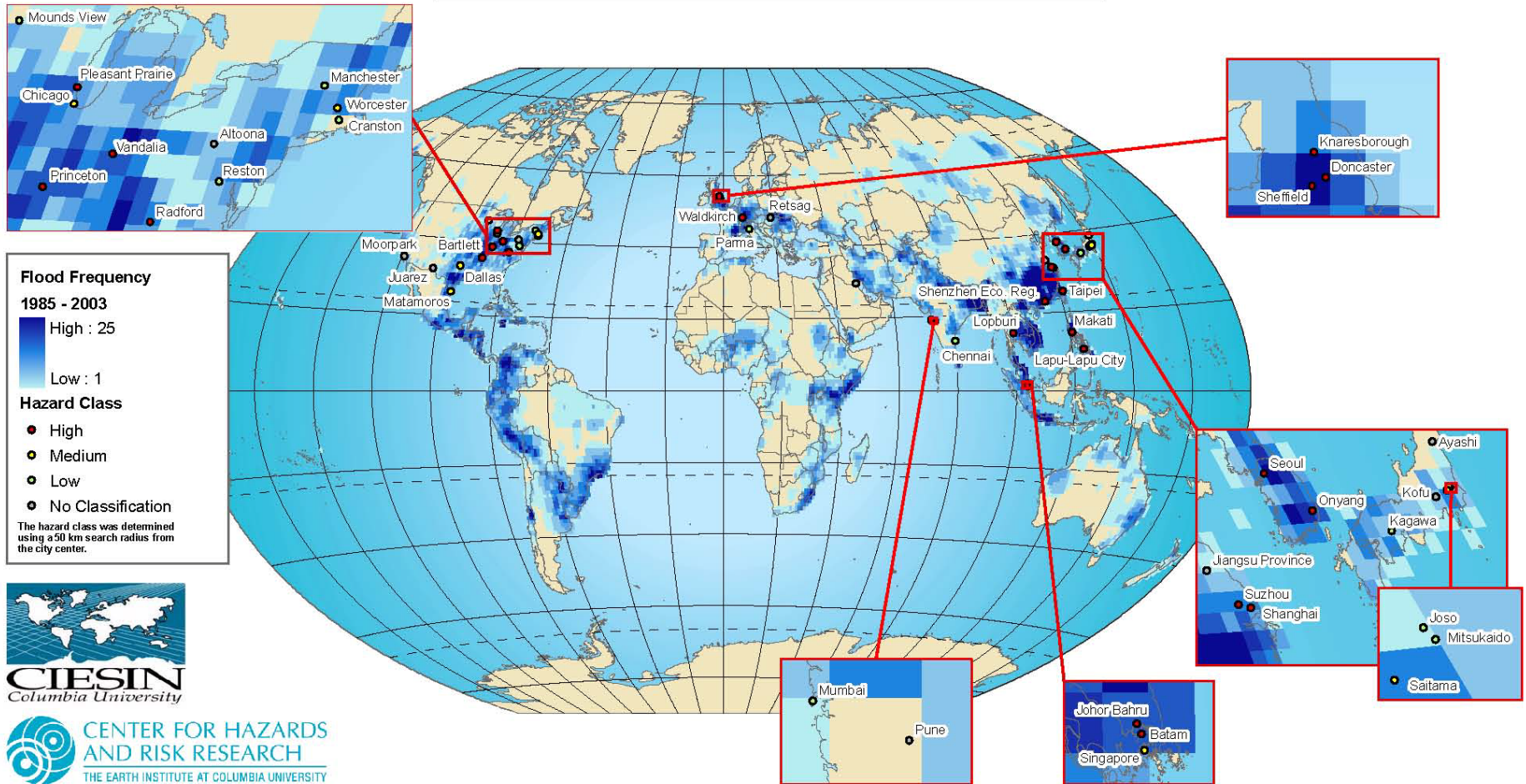
- Climate change impacts are **spatially** differentiated
- Vulnerabilities are **spatially** differentiated
- Adaptive/coping capacities are **spatially** differentiated

Georeferenced data on population, poverty, land use types, hazards, and climate change scenario outputs, together with ancillary biogeophysical data, can help us in our understanding of climate change impacts and vulnerability, and in turn inform where adaptation may be required



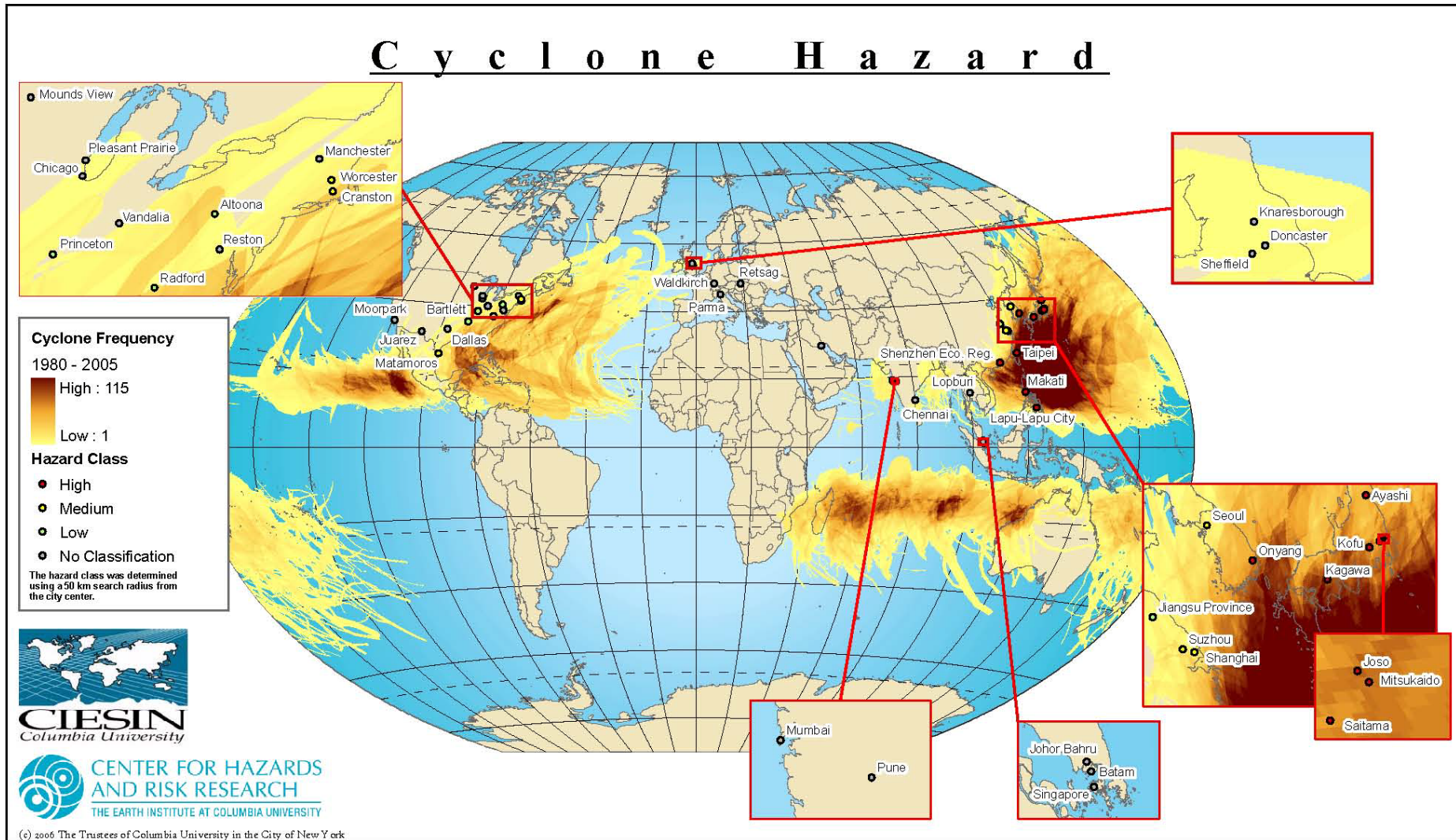
Exposure to Current Climate Hazards

Flood Hazard

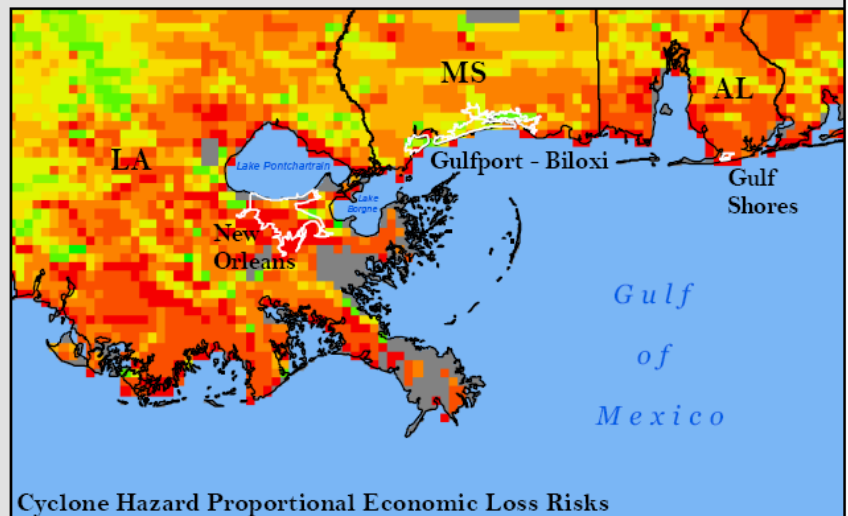
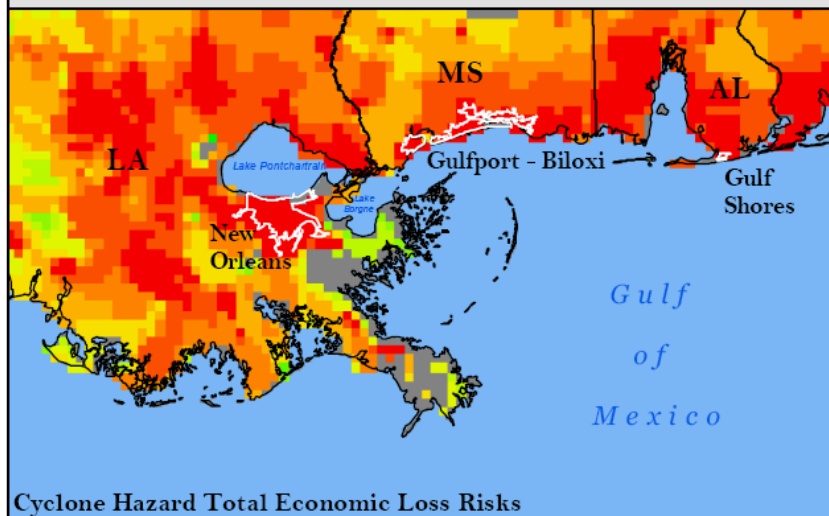
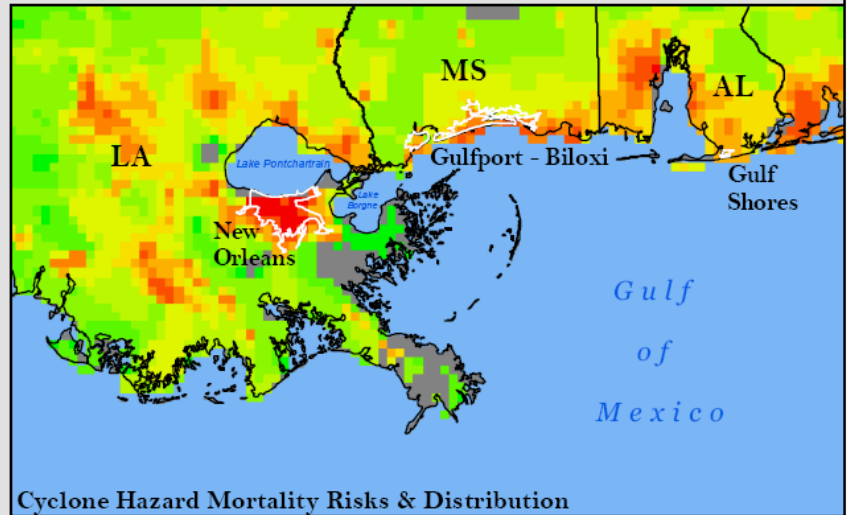
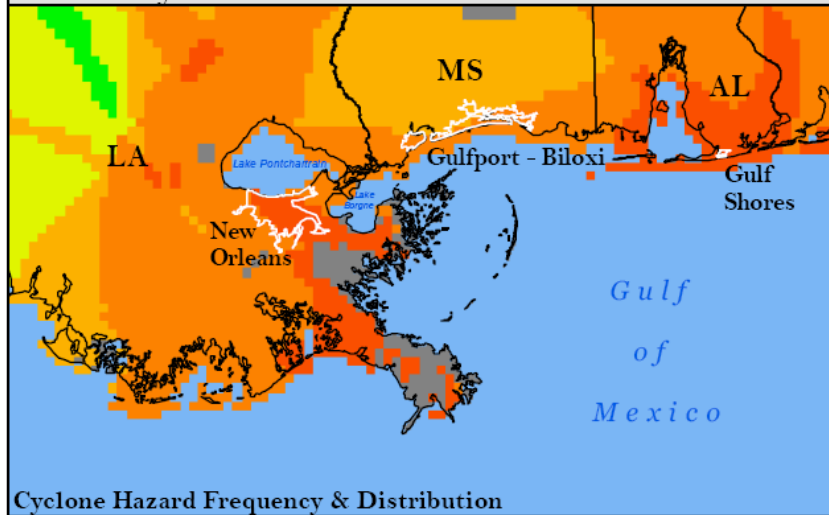


Source: Dilley, M., R.S Chen, U. Deichmann, A. Lerner-Lam and M. Arnold (2005), *Natural Disaster Hotspots: A Global Risk Analysis*, World Bank, Washington DC.

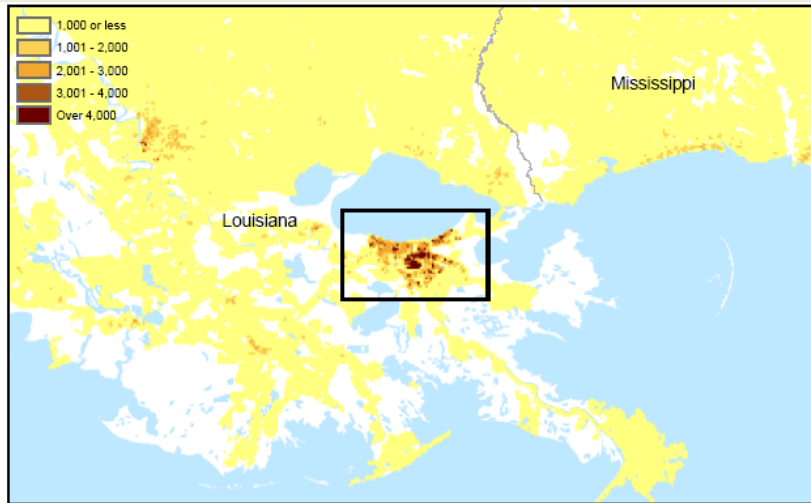
Exposure to Current Climate Hazards



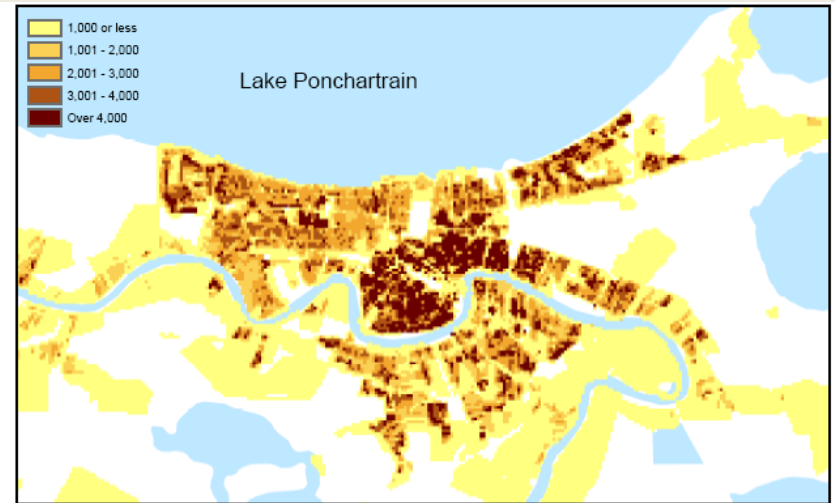
Source: Dilley, M., R.S Chen, U. Deichmann, A. Lerner-Lam and M. Arnold (2005), *Natural Disaster Hotspots: A Global Risk Analysis*, World Bank, Washington DC.



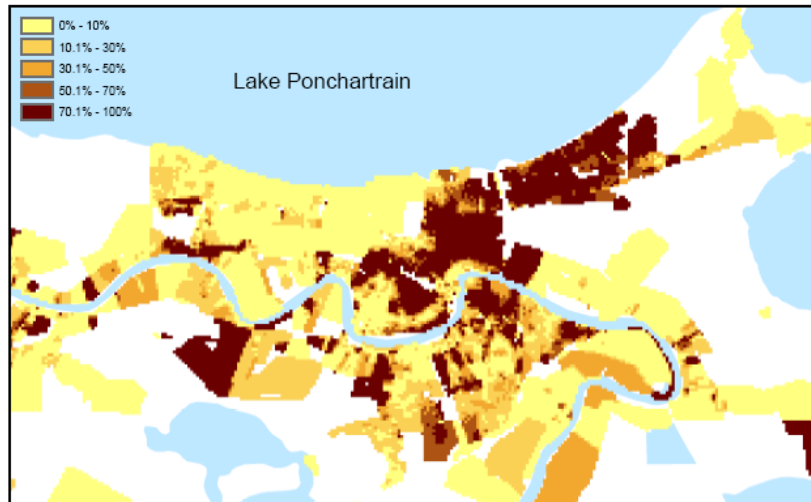
New Orleans Demographics



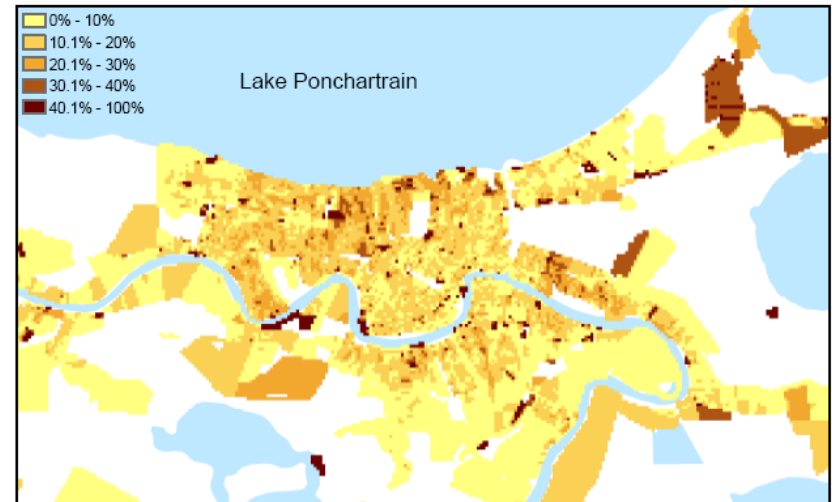
Population density per square km with area of detail



Population density per square km



Percentage of Blacks

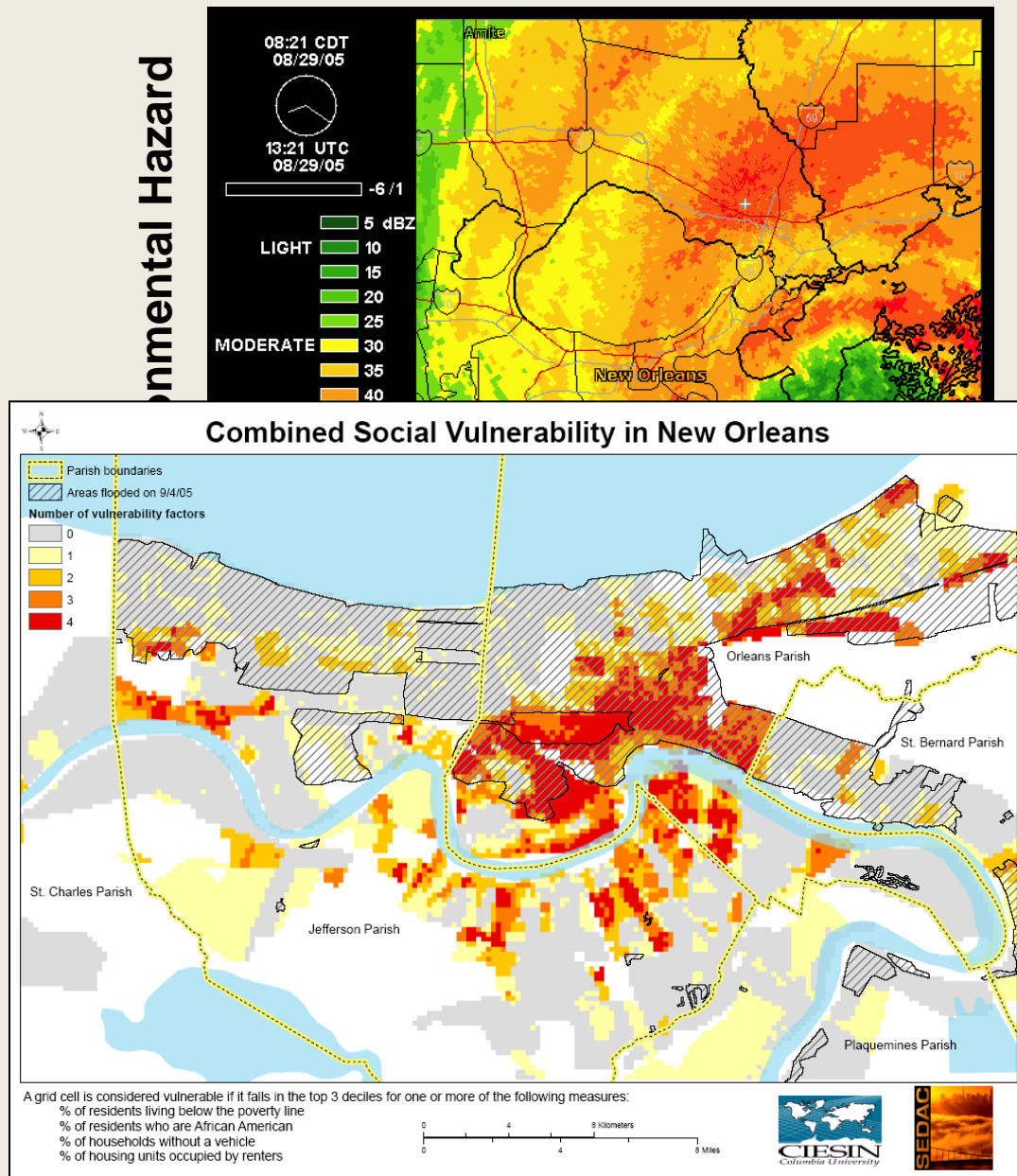


Percentage age 65 and older

0 5 10 20 Kilometers



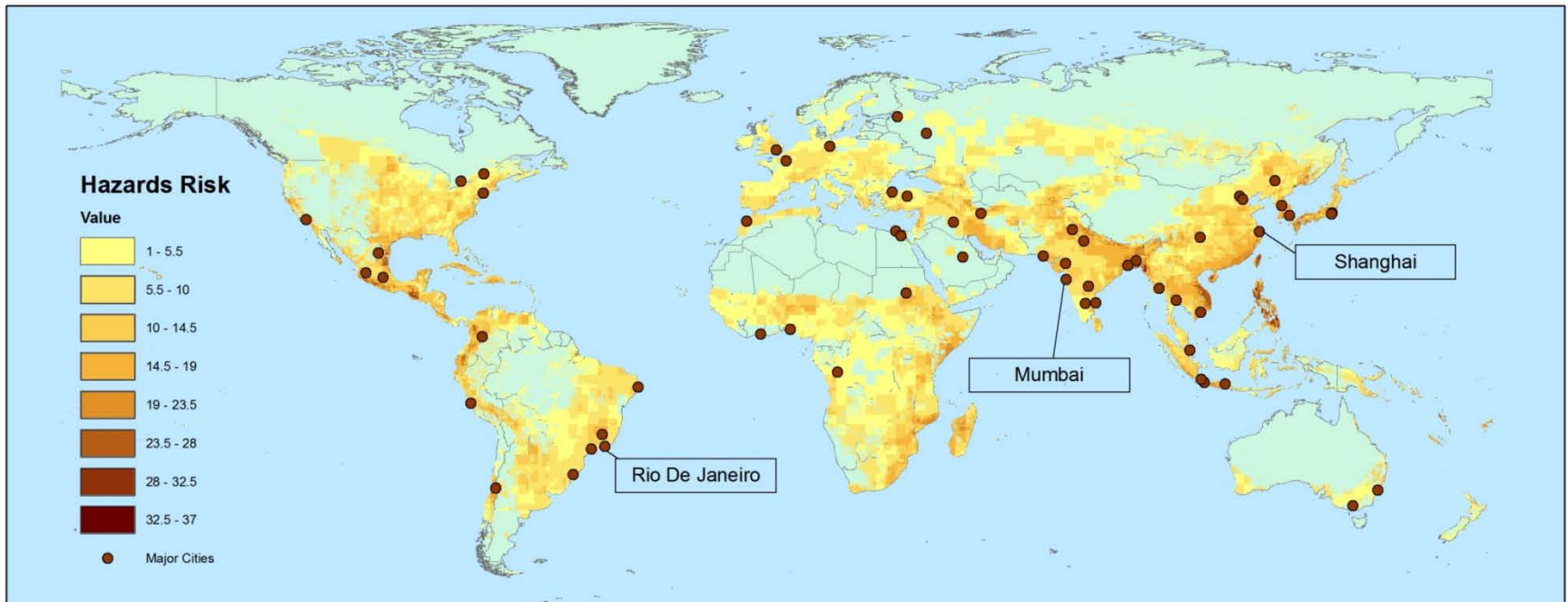
Integrating data to assess vulnerability: An example



Exposure (location) and
sensitivity (individual,
household and community
characteristics)

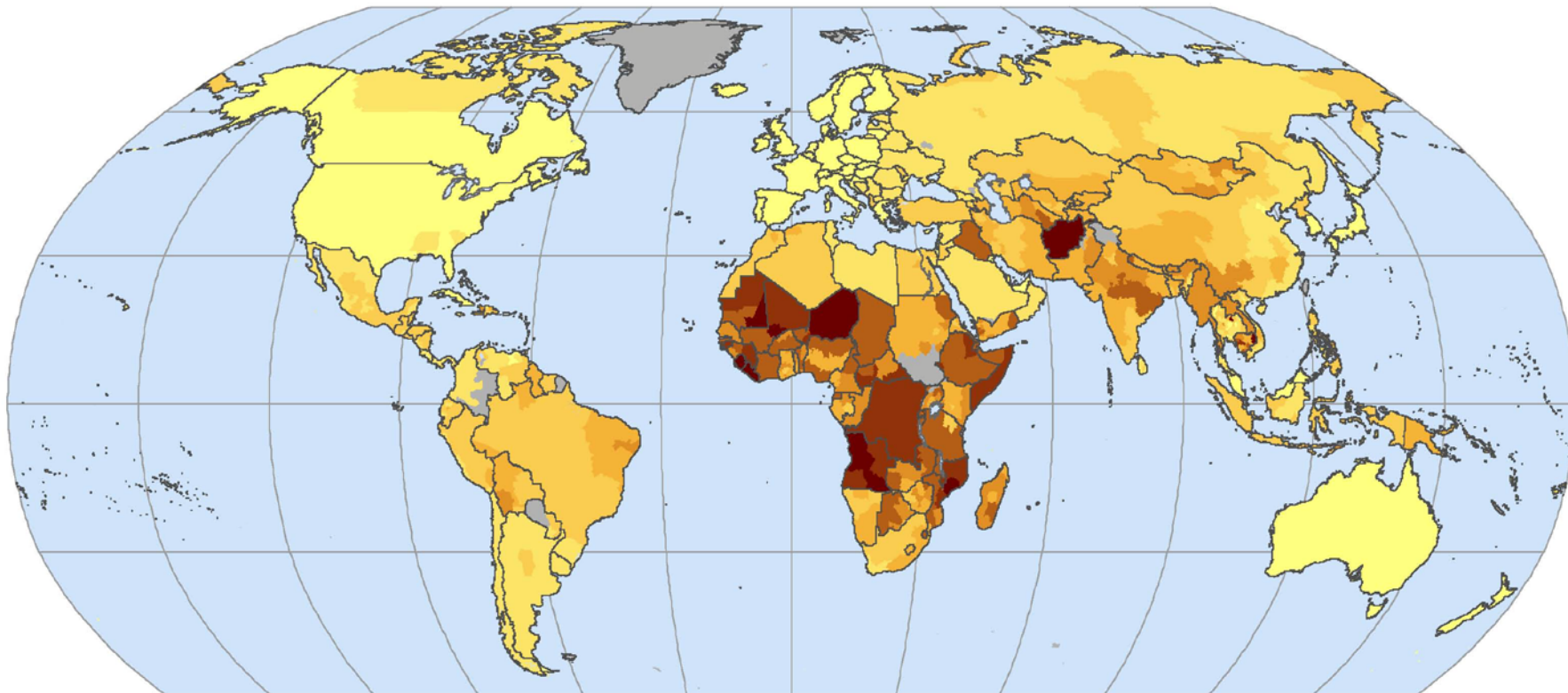
Exposure to hazards

Global Cities in Relation to Current Climate Related Hazards



Hazard risk represents a cumulative score based on risk of cyclones, flooding, landslides and drought.

Source: de Sherbinin *et al.* (2007). The vulnerability of global cities to climate hazards. *Environment & Urbanization*. 19(1): 39-64.



Robinson Projection

The World

By Subnational Administrative Level

Measures of Poverty

Infant Mortality Rates [IMR]

Subnational mortality rates are adjusted to 2000 using national trend data.

Original data for 96% of countries are from 1995 or later. All data are from 1990 or later.

Infant mortality rate, 2000
(deaths per 1000 live births)

< 9.1
9.1 - 25.0
25.1 - 50.0
50.1 - 75.0
75.1 - 100.0
100.1 - 125.0
125 - 150.0
150.0 <

no data

National Boundary



Copyright 2005, The Trustees of Columbia University in the City of New York.
Source: Center for International Earth Science Information Network (CIESIN),
Columbia University. Global subnational infant mortality rates; maps and
further documentation available at: <http://www.ciesin.columbia.edu/povmap>

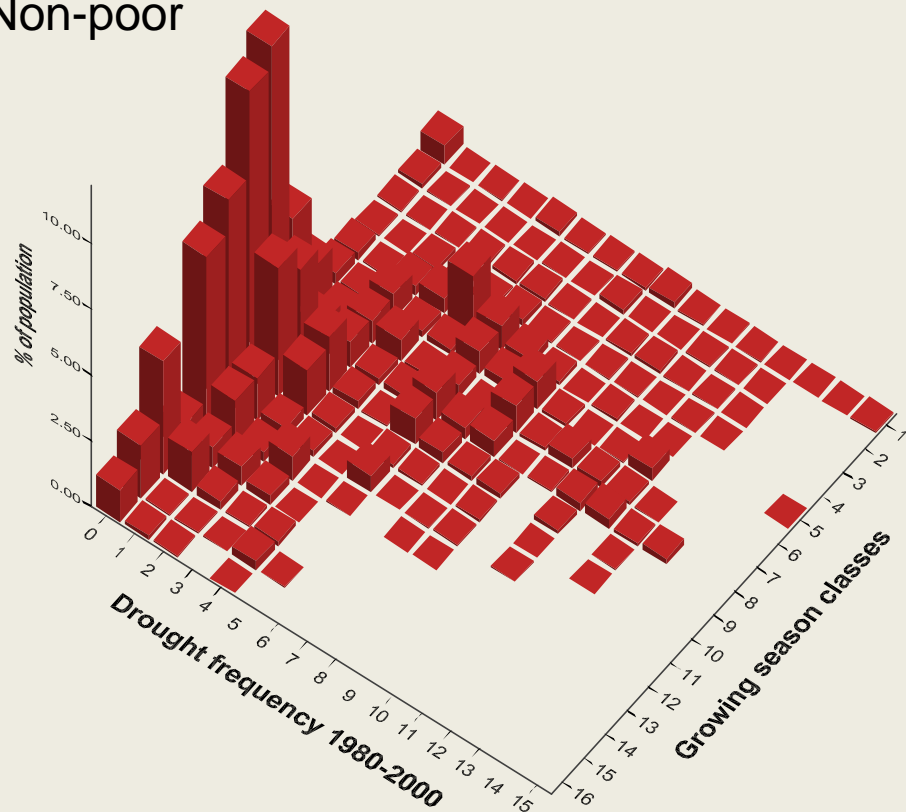
Subnational boundaries have been removed from countries for clarity.



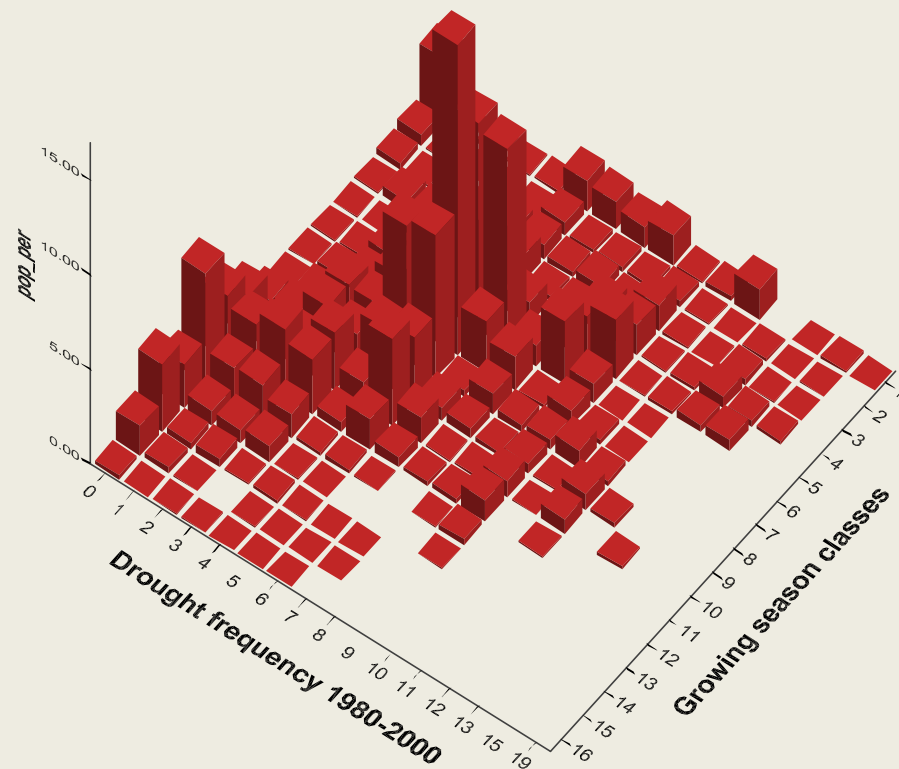
This document is licensed under a
Creative Commons 2.5 Attribution License
<http://creativecommons.org/licenses/by/2.5/>

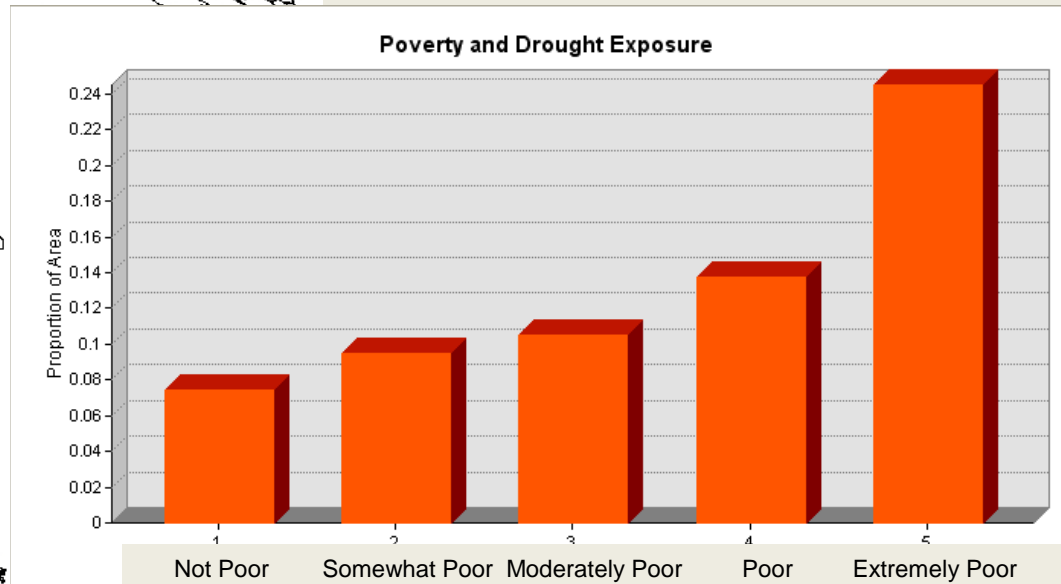
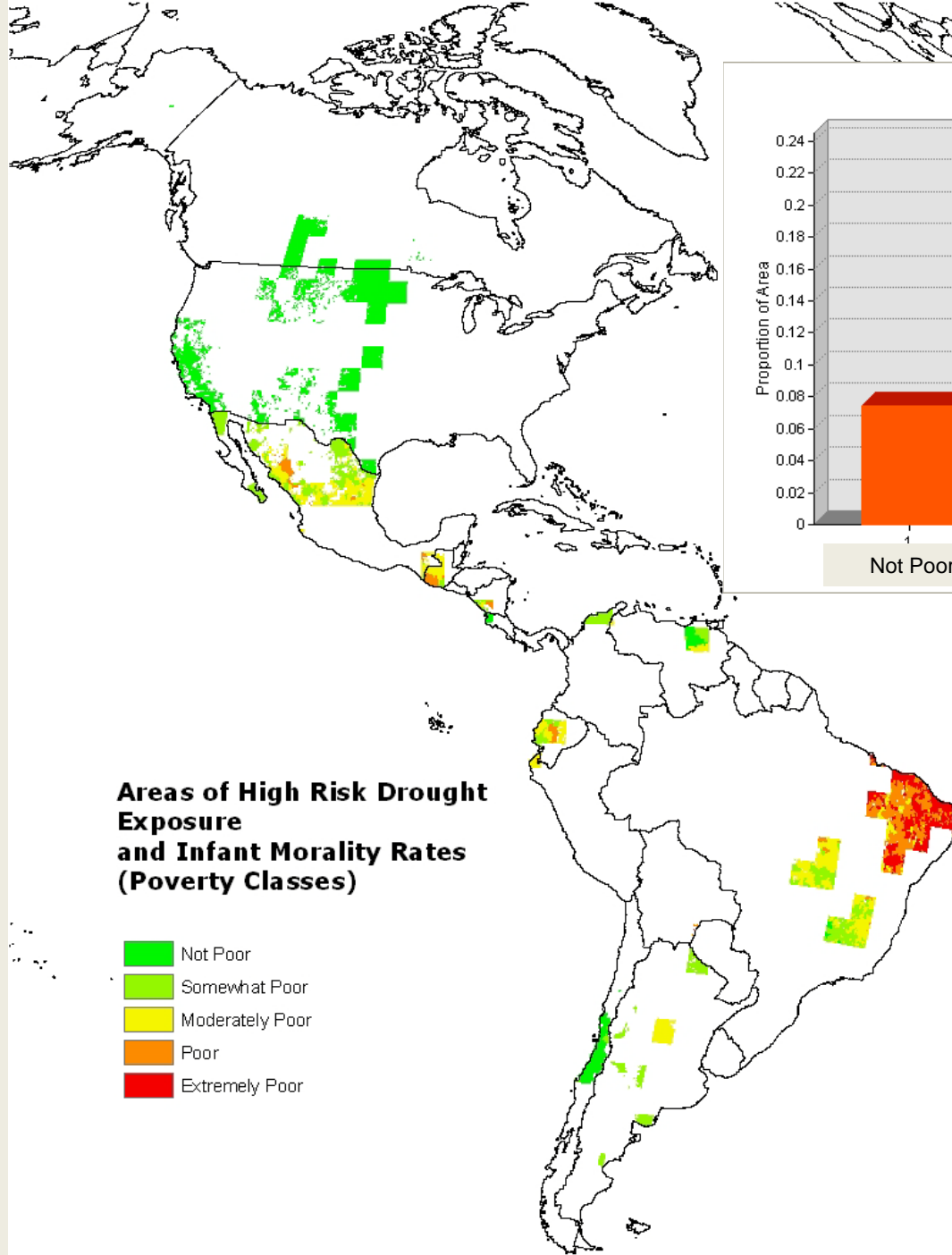
Compared with the non-poor, poor people are more likely to be found in drought-prone areas with shorter growing seasons

Non-poor



Poor



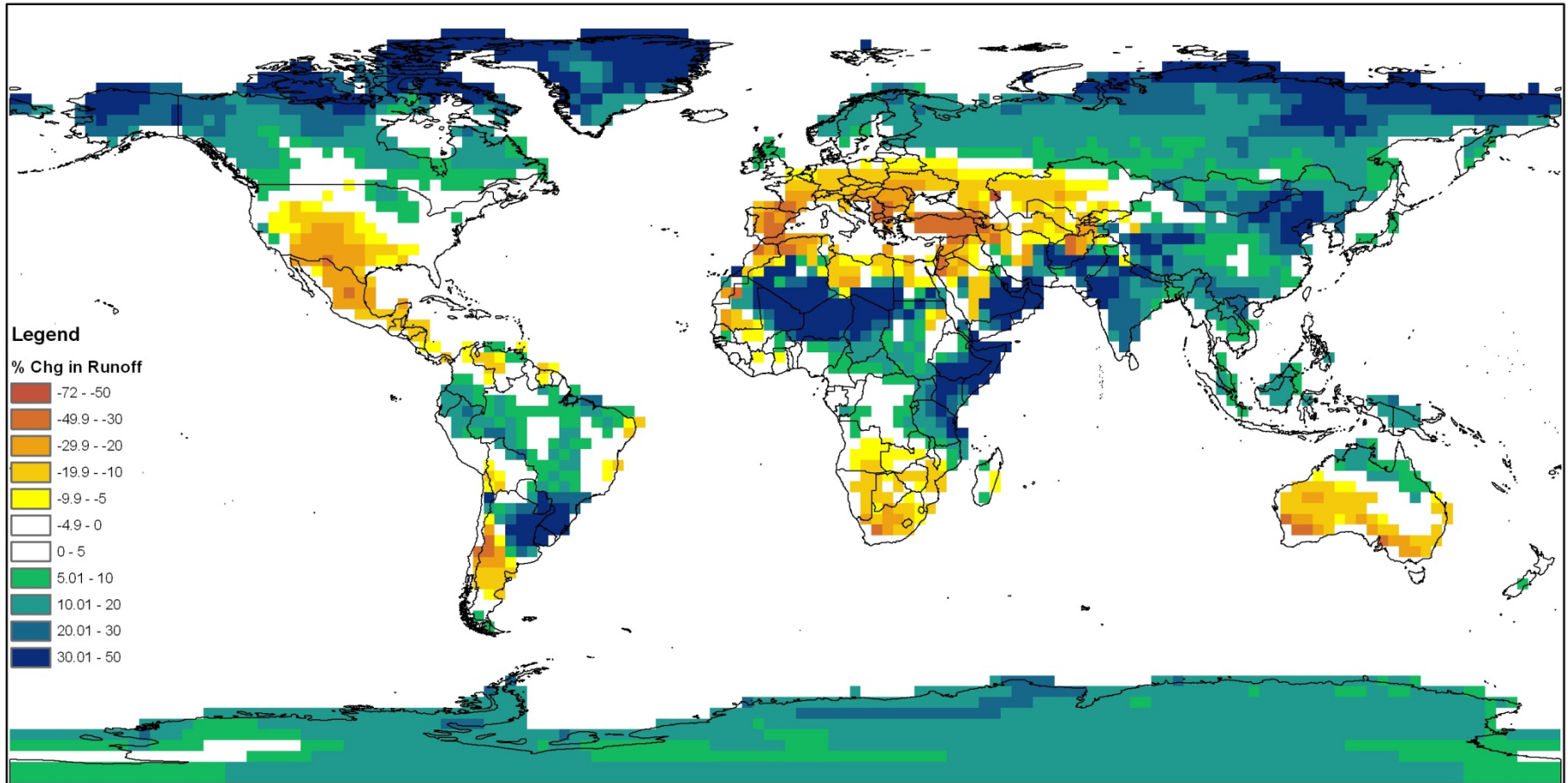


The poor are at much greater risk of experiencing a drought

Potential Future Vulnerabilities to Climate Change

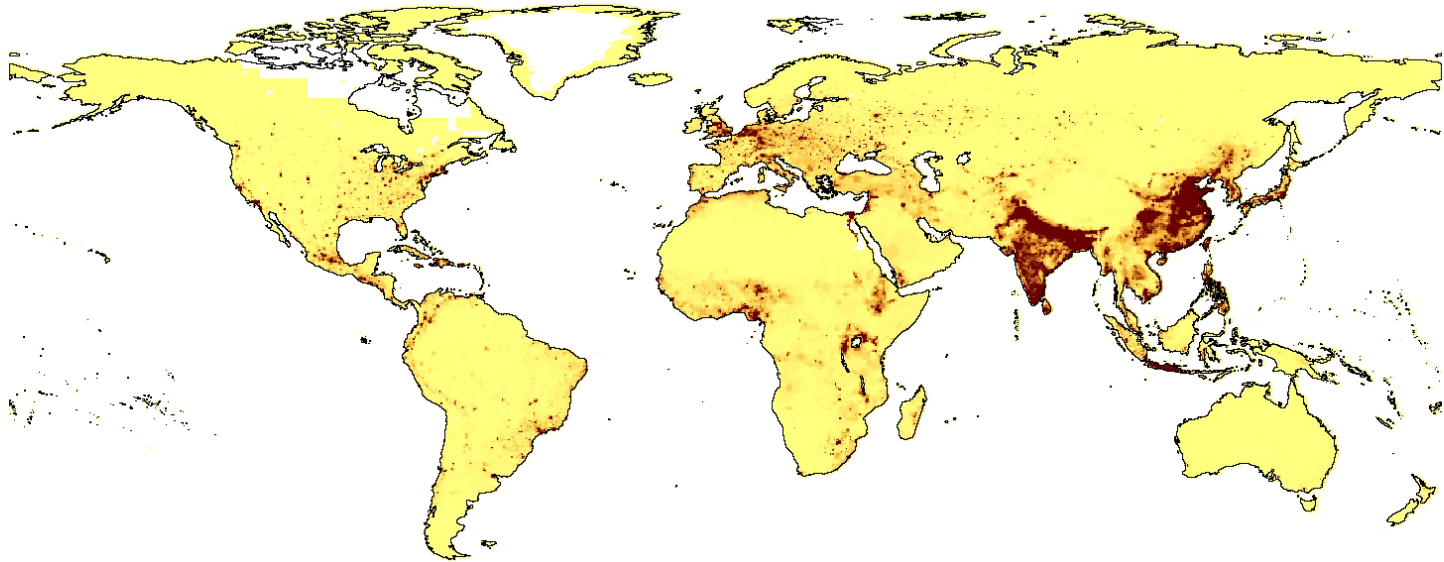


Change in Runoff by 2080

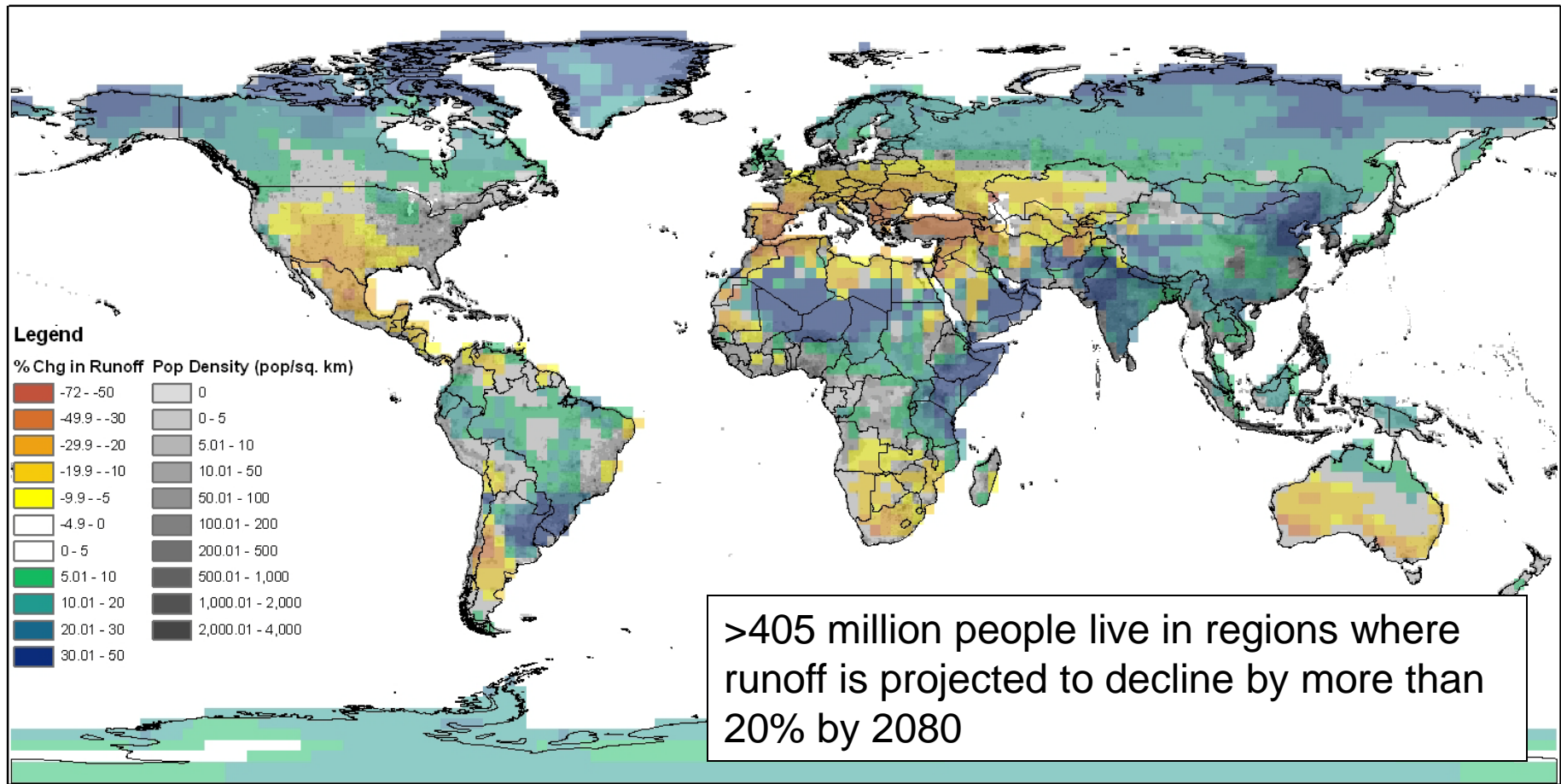


Source: Nohara et al.(2006). Impact of climate change on river runoff.
Journal of Hydrometeorology. 7: 1076-1089, cited in the IPCC AR4 WG-2
report.

Knowing where people are...



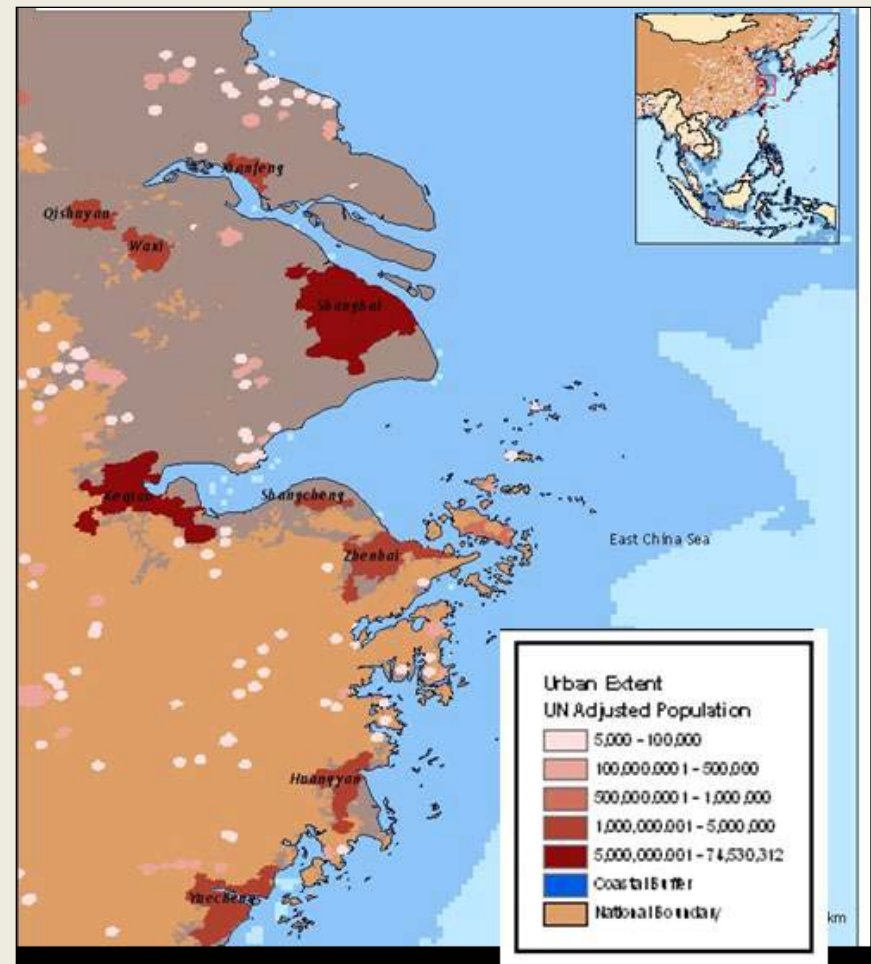
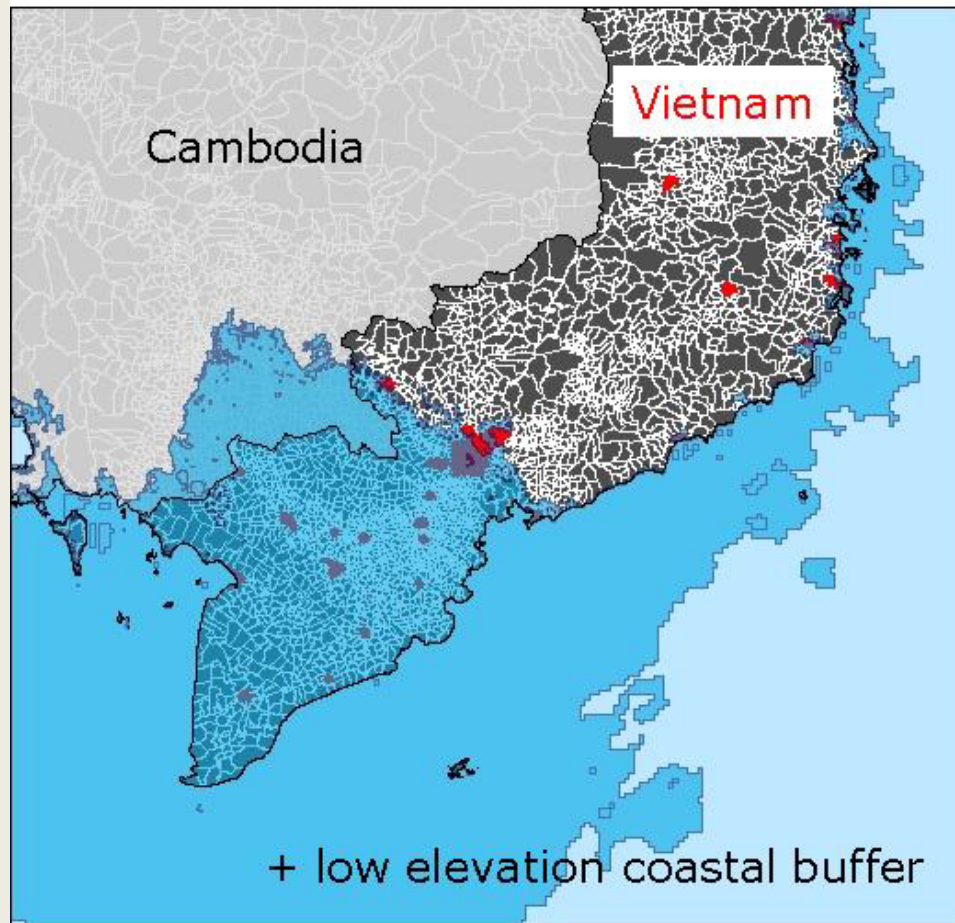
...in relation to prolonged drying, drought, and floods



Source: Adamo and de Sherbinin (2009). The impact of climate change on the spatial distribution of populations and migration. Proceedings of the Expert Group Meeting on Migration. New York: UN Population Division.



Knowing where people and cities are in relation to sea level rise of 10 meters

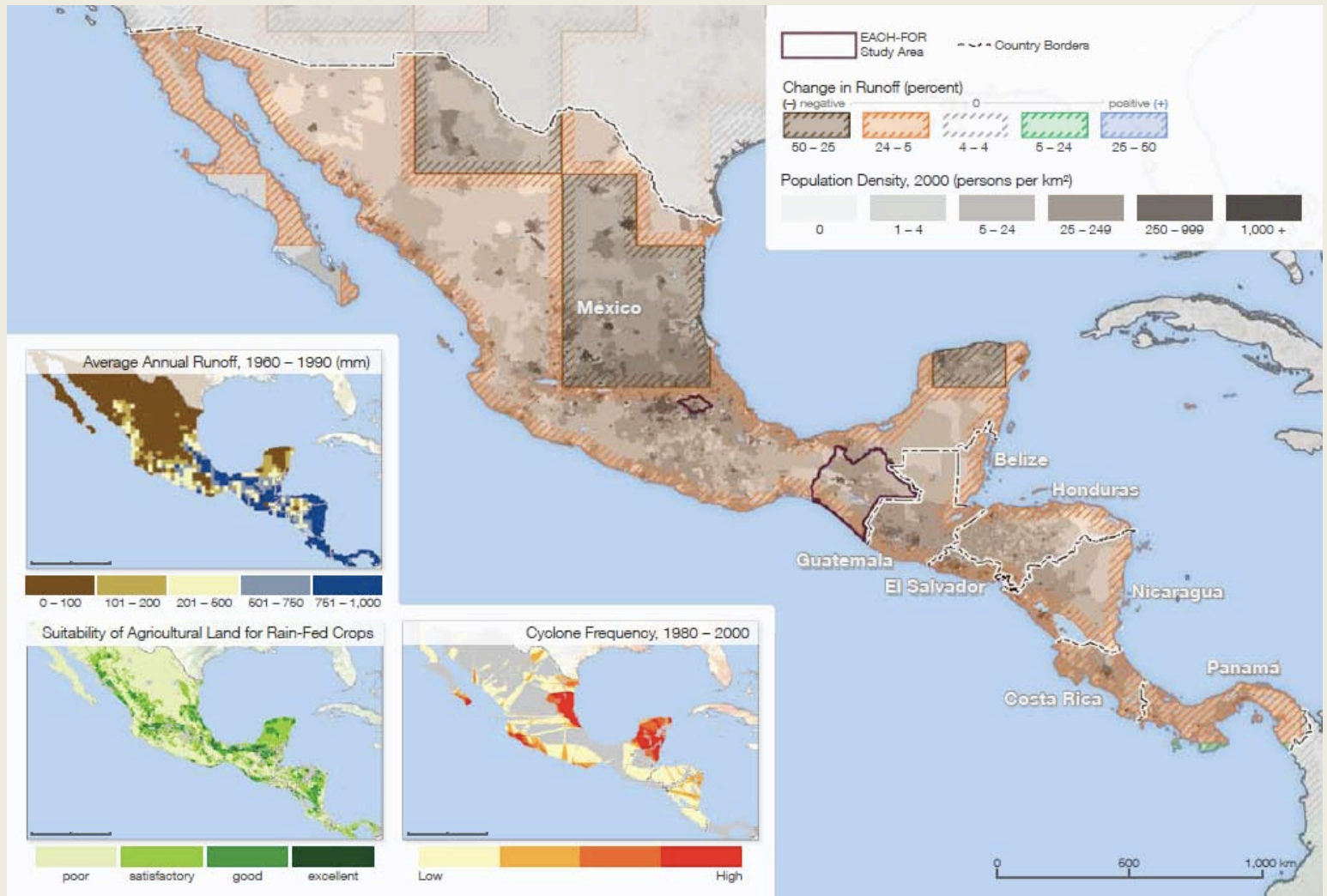


Source: Balk, D., G. McGranahan, and B. Anderson. 2006. *Population and Land Area in Distribution in Urban Coastal Zones A Systematic Assessment*. Earth System Science Partnership Open Science Meeting, Nov 2006, Beijing.

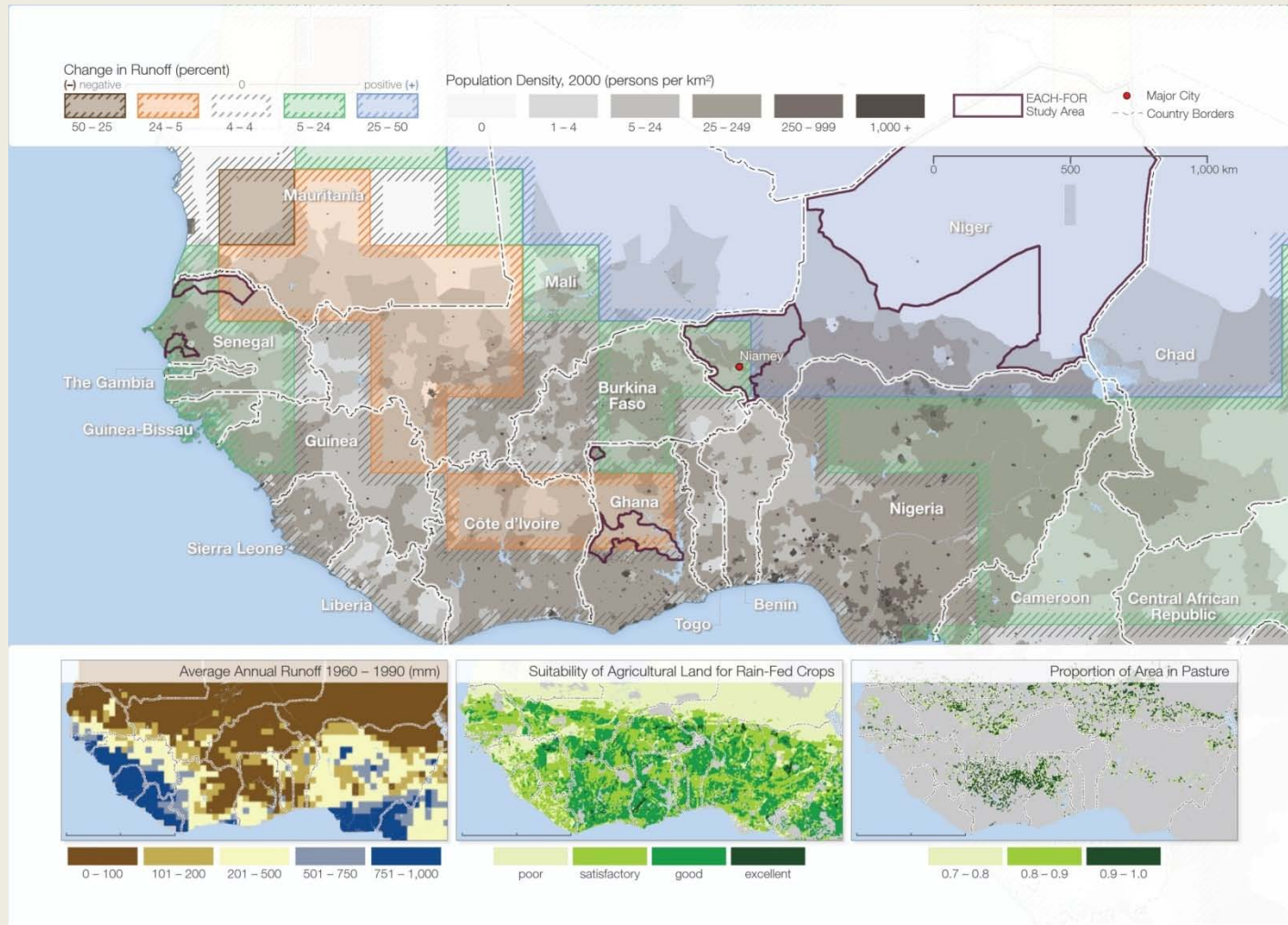
Differences in population in the low elevation coastal zone (LECZ) by Region

Region	Total Population		Urban population	
	(10 ⁶)	(%)	(10 ⁶)	(%)
Africa	56	7%	31	12%
Asia	466	13%	238	18%
Europe	50	7%	40	8%
Latin America	29	6%	23	7%
Australia & N. Z.	3	13%	3	13%
North America	24	8%	21	8%
SIS	6	13%	4	13%
<i>World</i>	634	10%	360	13%

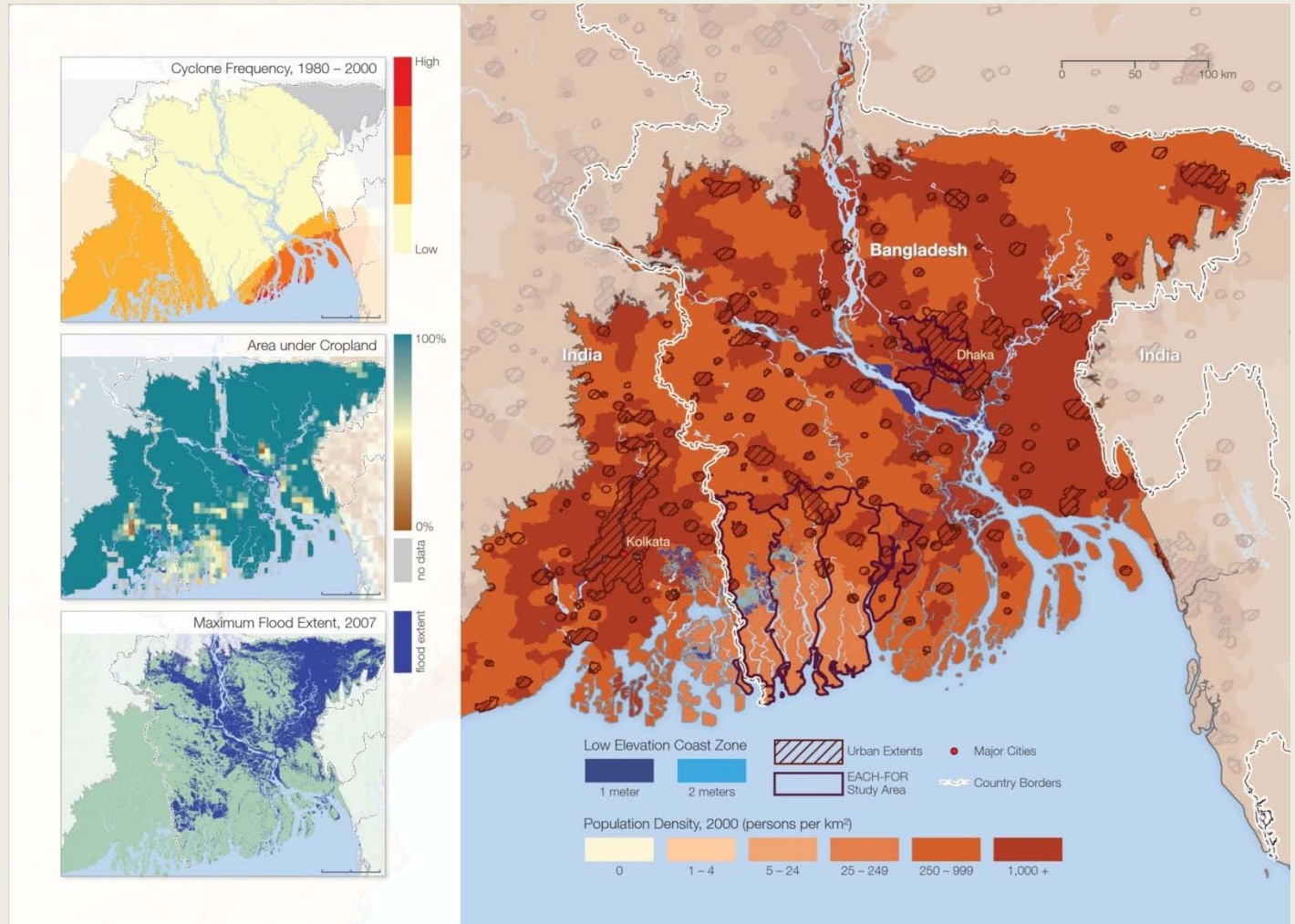
Drying up and moving out - Central America



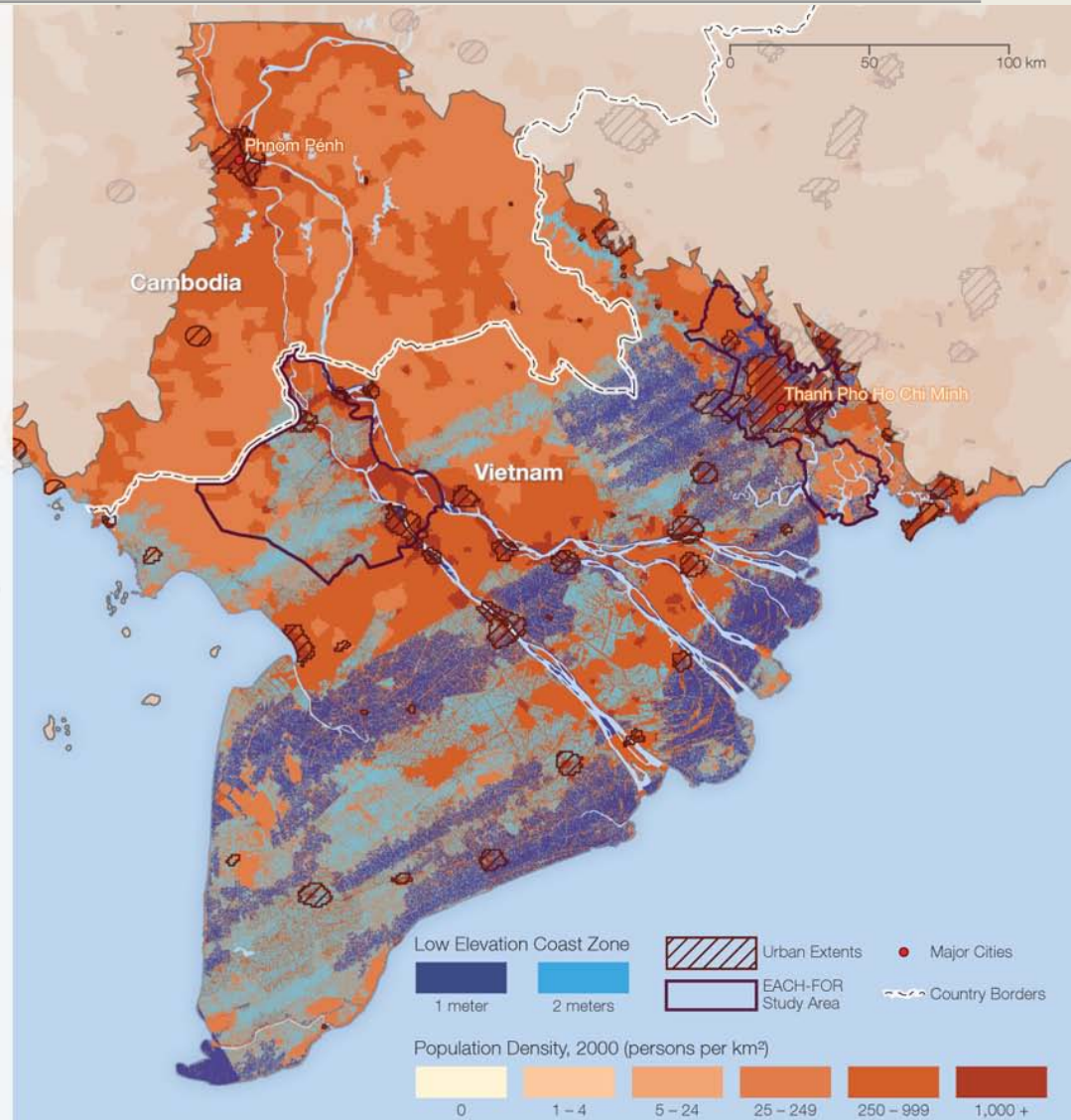
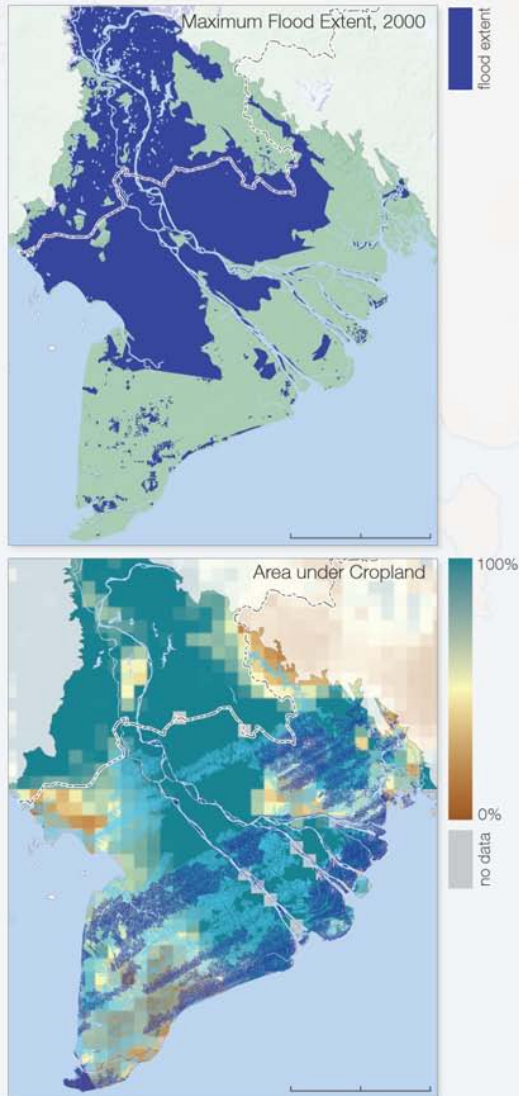
Creeping onward migration – The Sahel



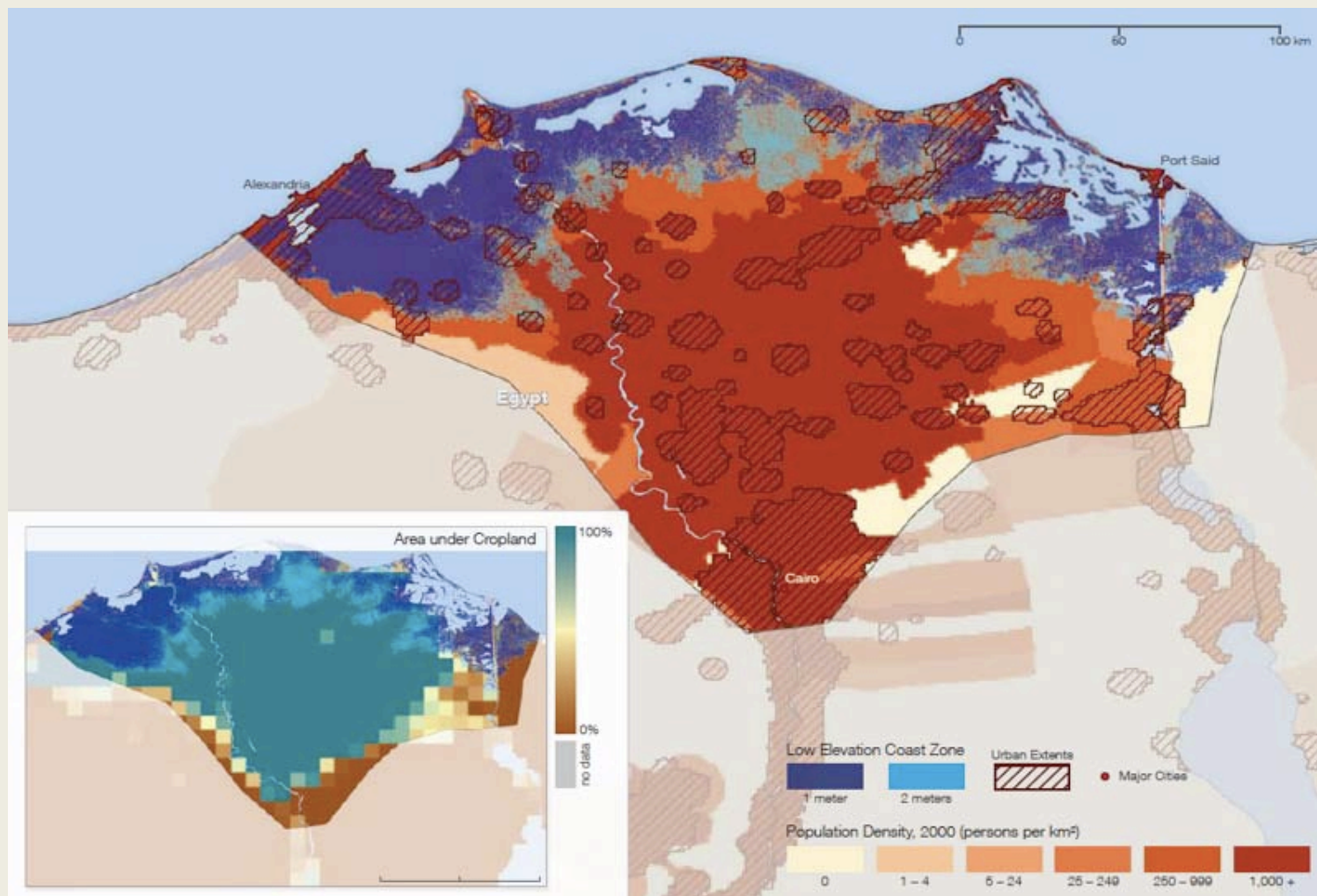
Migration as a survival strategy – The Ganges Delta



Living with floods and resettlement – The Mekong Delta



Between desertification & sea level rise - The Nile Delta



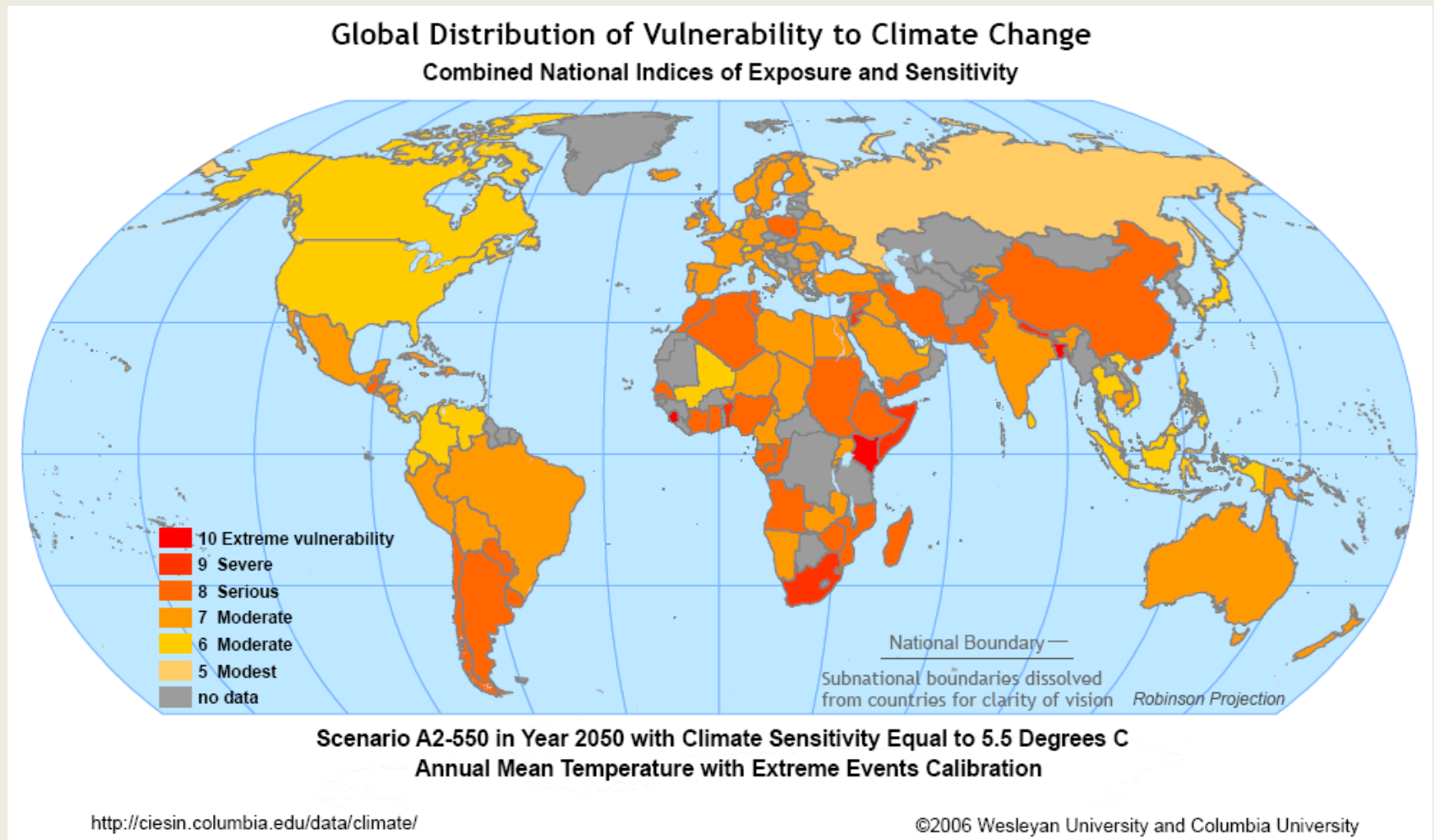
Sea level rise - Tuvalu



Sea level rise – The Maldives



This study sought to measure vulnerability as a function of adaptive capacity



Source: Yohe, G., E. Malone, A. Brenkert, M. Schlesinger, H. Meij, X. Xing, and D. Lee. 2006. "A Synthetic Assessment of the Global Distribution of Vulnerability to Climate Change from the IPCC Perspective that Reflects Exposure and Adaptive Capacity." Palisades, New York: CIESIN, Columbia University. <http://ciesin.columbia.edu/data/climate/>

